

2016-06-12-gouvea

William A. Stein

6/12/2016

Contents

```
L.<zeta3> = CyclotomicField(3)
KL.<a> = L.extension(x^3 - x^2 - 2*x - 8)
print KL
Number Field in a with defining polynomial x^3 - x^2 - 2*x - 8 over its base field

KL.maximal_order().basis()
[-9/2*zeta3*a^2 - 17/2*zeta3*a - 14*zeta3 - 1, (-7*zeta3 - 3/2)*a^2 + (-17*zeta3 - 3/2)*a
- 30*zeta3 - 12, (-25/2*zeta3 - 3)*a^2 + (-67/2*zeta3 - 3)*a - 60*zeta3 - 28, (-19*zeta3 -
9/2)*a^2 + (-38*zeta3 - 1/2)*a - 75*zeta3 - 20, (-10*zeta3 - 3)*a^2 + (-8*zeta3 + 6)*a -
31*zeta3 + 8, (-25*zeta3 - 7)*a^2 + (-65*zeta3 - 6)*a - 119*zeta3 - 55]

KL.relative_discriminant()
Fractional ideal (503)

KL.absolute_discriminant()
-6831243

R = KL.maximal_order()
for z in R.basis():
    print factor(sqrt(KL.order([zeta3, z]).absolute_discriminant() /\
    KL.absolute_discriminant()))
2^2 * 181^2
2^2 * 73 * 300889
2^2 * 7^3 * 751 * 6037
10867 * 1190743
2^6 * 19 * 139 * 2011
2^2 * 109 * 769 * 1009291

alpha = R.basis()[3]; alpha
(-19*zeta3 - 9/2)*a^2 + (-38*zeta3 - 1/2)*a - 75*zeta3 - 20

alpha.absolute_minpoly()
x^6 - 192*x^5 + 87193*x^4 + 1805540*x^3 + 82404469*x^2 - 11115296*x + 476656
```